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GENERAL SAMPLING AND ANALYSIS PLAN FOR ASSESSING ASBESTOS RELEASE FROM BUILDING DEMOLITION AT THE LIBBY, MONTANA, SUPERFUND SITE

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Prepared by

US Environmental Protection Agency

Region 8

Denver, CO

With Technical Assistance from:

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Denver, CO

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APPROVAL PAGE

This General Workplan has been prepared by the U.S. Environmental Protection Agency, Region 8, with technical support from Syracuse Research Corporation. The general strategy described is approved for use for building demolition activities in Libby.

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DOCUMENT REVISION LOG

Revision	Date	Primary changes
0	05/04/2005	--
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GENERAL WORKPLAN FOR BUILDING DEMOLITION LIBBY, MONTANA SUPERFUND SITE

1.0 INTRODUCTION

The US Environmental Protection Agency (USEPA) is currently investigating and addressing potential human health risks from the presence of asbestos in Libby, Montana, under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly referred to as Superfund.

When asbestos contamination is located in or around a home or business in Libby, the most appropriate response depends on the level and extent of contamination, the probability of human exposure, and the feasibility of the various alternatives for dealing with the contamination. In most cases, the preferred clean-up option is removal of the contaminated source material (insulation, soil, dust) that may be posing an unacceptable health risk at that location. However, in some cases, either the physical integrity of a structure or the extent of contamination may make the removal of source material unsafe or not feasible. In these special cases, demolition of the structure may become the preferred alternative.

When a building that contains asbestos is being demolished, there is the possibility that asbestos could be released to the air, potentially causing exposures of workers or nearby residents, and potentially causing contamination of nearby properties. Under the authority of the Clean Air Act, the USEPA has established a set of National Emission Standards for Hazardous Air Pollutants (NESHAPs), including regulations that apply to the release of asbestos during building demolition (CFR 61, Subpart M, Section 61.145). In brief, before demolition occurs, regulated asbestos-containing materials (RACM) are removed from the building if a) they are friable or otherwise subject to airborne release during demolition, and b) are present in amounts that exceed certain minimums. Following removal of the RACM, the building is demolished, using water to wet the debris and limit the release of dust into the air. In cases where the building is not safe for entry, removal of RACM is not required.

This document describes a generalized initial approach developed by EPA Region 8 for ensuring that any demolition projects performed at Libby do not cause unacceptable exposures of workers or residents to asbestos. In brief, the basic NESHAPS approach will be followed to the extent practicable in order to minimize asbestos releases, and will be coupled with extensive monitoring to ensure that, if any releases do occur, they are properly identified and quantified so that response action may be taken to address the release, as necessary. It is anticipated that, after experience is gained at several demolition projects, the extent of environmental monitoring around sites may be modified (simplified).

Note that this document is not intended to serve as a detailed workplan for the demolition of any specific building. Rather, a site-specific workplan will be developed for each specific demolition activity, and that workplan will include all project-specific details.

2.0 DATA QUALITY OBJECTIVES

EPA has developed a seven-step Data Quality Objectives (DQO) procedure that is designed to ensure that data collection plans are carefully thought out and to maximize the probability that the results of the effort will be adequate to support decision-making. Application of this seven step procedure to this project are presented below.

Step 1. State the Problem

Demolition of a building that contains asbestos (LA?) could result in a release of asbestos (LA?) to the environment. However, the magnitude and extent of any such release cannot be predicted from the nature and degree of contamination in the structure of concern.

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Step 2. Identify the Decision

In general, two decisions will be made at each demolition site:

- Has a release of asbestos (LA?) occurred as a result of building demolition activities?
- If so, did the release cause environmental contamination that is large enough to warrant removal action under the December 2003 Action Plan? (before and after the demolition)
- Worker exposure evaluations? And hence differing needs with respect to target sensitivities?

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Step 3. Identify Inputs to the Decision

Data needed to achieve this objective consist of accurate and reliable measurements of asbestos levels in air and dust that result from demolition activities.

Step 4. Define the Study Boundaries

The primary zone of interest around each demolition site is the area where dust releases from demolition activities are most likely to be deposited and cause potential contamination. The size and location of the zone may vary from site to site, depending on the size of the building being demolished, the direction and speed of the wind, and the location and proximity of adjacent structures. However, in general, the zone of chief interest will extend outward from the demolition site for about 500 feet.

Comment [R1]: What is the basis for assuming 500 ft (refs?)? Field recommendation is about 100 to 150 ft However, the zone of chief interest will extend outward to the surrounding properties up to about 200 feet?

Step 5. Develop a Decision Rule

The decision rule is:

> If the concentration of asbestos in dust released during demolition is not significantly ($p>0.05$) increased over baseline, or if an increase occurs but does not result in increments in asbestos concentrations in outdoor soil or indoor dust that are of human health concern, either currently or based upon future information from investigations at the Libby site, then no remedial action will be needed. Conversely, if dust released during demolition does contain a significant ($p\leq0.05$) increase in the baseline concentration of asbestos, and if the increase does result in an increase in the asbestos content of outdoor soil or indoor dust that is of potential human health concern, then remedial actions may be needed to clean up the release.

Comment [R2]: TAU needs to rewrite this decision rule section.

The exact method used to determine if a release has occurred will depend upon the data. In general, one or more samples will be used as a frame of reference (e.g., air samples collected upwind or dust fallout samples collected on the day before demolition), and these will be compared with one or more samples collected in association with the demolition activity. Statistical methods for comparing count-based results (s/cc or s/cm^2) are described in Nelson (1982).

The level of asbestos exposure that is of health concern is a matter of judgment. At most Superfund sites, EPA considers lifetime excess cancer risks that do not exceed 1E-04 to be within acceptable bounds (USEPA 1991). Attachments 1 and 2 (below) present risk-based calculations of the concentration of asbestos in outdoor air, outdoor soil and indoor dust that may pose an excess lifetime cancer risk of 1E-04 to workers or residents. These risk-based concentrations will be used to identify demolition-related releases to air, soil, or dust that may be of potential human health concern. It should be noted that these calculations are based on the best information available at the present, but are subject to refinement as newer data become available from on-going data collection efforts at the site (USEPA 2005). It should also be noted that, at present, EPA has not established a method for quantifying or evaluating non-cancer risks from inhalation exposure to asbestos. It is considered likely that if risks of cancer effects are within acceptable limits that risks of non-caner effects will also be below a level of concern, but this is a source of substantial uncertainty.

Comment [R3]: Revisit this section. Consider using Dec 2003 action plan (soil and indoor dust) as criteria for action. Acknowledge that levels will be modified as new data become available. Still need to keep this section to the extent it informs target sensitivity – should be congruent with ambient air monitoring program dqos/sap.

Comment [R4]: Must also consider levels with respect to non cancer risks.

Step 6. Specify Limits on Decision Errors

All estimates of risk due to exposure to environmental contaminants are uncertain. This uncertainty arises from uncertainties at many levels, including:

- uncertainty in the true concentration of asbestos in an environmental medium
- uncertainty in the true level of human exposure to the medium
- uncertainty in the health consequences of a specified level of exposure

Although uncertainty in the true concentration of asbestos in an environmental medium is only one part of the overall uncertainty, it is important that estimates of concentration are within reasonable uncertainty bounds.

For asbestos, analysis of air and dust samples occurs by observing and counting the number of structures on a filter that satisfy some specified set of counting rules. Thus, the basic output of the analysis is N (the number of structures), and concentration (air) or loading (dust) is calculated from N. The uncertainty around any value of N is given by the Poisson distribution. In general, the relative uncertainty (the width of the uncertainty interval divided by the value of N) decreases as N increases. For the purposes of this project, the goal is to analyze samples of air and dust with an analytical sensitivity that would be sufficient to result in a count of about 10 asbestos structures if the true concentration is at the 1E-04 level of concern. The 90% confidence interval around a count of 10 is from 5.4 to 17.0. Calculations of the required sensitivity to achieve a count of 10 if the true concentration were at the 1E-04 level are presented in Attachments 1 and 2.

Comment [R5]: Revise based on discussion above.

For soil, all analyses will be by PLM-VE which is a semi-quantitative procedure. Based on site-specific studies, it is believed that if asbestos is present at a level of 0.2% or higher, PLM-VE will detect the presence of the asbestos in a high fraction of all samples.

Step 7. Optimize the Design for Obtaining Results

The design for monitoring potential releases of asbestos from demolition projects will be refined and improved incrementally as data become available and as information is gained on the magnitude and patterns of potential releases.

3.0 OVERVIEW OF DEMOLITION STRATEGY

Each structure selected for demolition will be evaluated individually, and a project-specific plan will be prepared for each structure. EPA will notify the Montana Department of Environmental Quality Asbestos Control Program of planned demolitions.

3.1 Inspect for ACM

In accord with the basic strategy described in the NESHAPs regulations, the first step in building demolition in Libby will be inspection of the structure to determine if it is structurally sound. If so, then the building will be inspected for materials that contain friable ACM that exceed NESHAP guidelines for amount. These are summarized below:

- More than 80 linear meters of ACM pipe insulation
- More than 15 square meters of friable ACM on walls or ceilings or in floor material
- More than 1 cubic meter of bulk material (e.g., vermiculite attic insulation)

If any ACM are identified that exceed one or more of the criteria above, that ACM will be removed to the extent practical and feasible as determined by the Remedial Project Manager or On-Scene Coordinator. If safety or feasibility prevents removal of ACM, the materials will be left in place and the following steps will be taken to ensure that unacceptable releases to the environment do not occur during demolition.

3.2 Building Demolition and Real-Time Monitoring

Buildings will be demolished using standard demolition techniques. Water will be sprayed on the building before and during demolition to limit the release of dust generated during the demolition process. Berms will be constructed around the demolition site to trap water runoff and prevent it from migrating to off-site locations.

During demolition, three different methods will be used to monitor for conditions that might lead to excessive dust release:

a) Wind Speed. Wind speed and direction will be recorded continuously using electronic instruments. If the average wind speed exceeds 10 mph, building demolition will be halted until the wind speed decreases.
b) Dust in Air. Dust levels in air will be monitored using an array of six Real-Time Air Monitors (RAM) located around the perimeter of the demolition site. If the signal from any RAM exceeds 5 mg/m^3 (the OSHA standard for nuisance dust), demolition activities will be halted until application of water to the building reduces dust levels to an acceptable amount.
c) Visual Observation. During demolition, the project supervisor will carefully watch for evidence of visible dust moving to off-site locations. If this occurs, demolition activities will be halted until application of water to the building reduces levels to an acceptable amount.

3.3 Environmental Monitoring

During building demolition, a series of environmental samples will be collected and analyzed for asbestos. The purpose of these samples is to confirm that unacceptable releases have not occurred. If the data indicate that, despite all efforts to control release, an unacceptable release did occur, EPA will investigate what actions are needed to clean up any properties that were impacted by the release.

3.3.1 Personal Air Monitors for Workers

All workers involved in the demolition of properties at Libby will wear personal protective equipment (PPE) in accord with the health and safety plan (HASP) developed for the project. In addition, in accord with OSHA regulations, all workers involved in building demolition will wear personal air monitors that allow evaluation of the level of asbestos contamination in the air at the demolition site. These samples will be evaluated using both phase contrast microscopy (PCM) within 24hours as described in NIOSH Method 7400, and at a later date by transmission electron microscopy (TEM) using ISO 10312 counting rules, modified to include all structures with an aspect ratio $\geq$ 3:1. All samples will be analyzed with an analytical sensitivity of 0.001 s/cc. This analytical sensitivity will be more than sufficient to identify any airborne levels of potential concern for short-term exposure of workers (see Attachment 1). In addition, this will allow reliable characterization of asbestos levels in air closest to the source of any potential releases. In accord with standard site practices, air filters and microscope grids will be archived for future evaluation if necessary.

3.3.2 Perimeter Air Monitors

At each demolition site, a series of stationary air monitors will be installed to measure asbestos levels in air. The exact placement of the airborne monitors should be specified on a project-specific basis, depending on the site characteristics. However, in general, the perimeter air monitoring network should consist of three concentric rings of monitors, as follows:

1. The innermost ring should be as close to the building undergoing demolition as conditions will allow. This ring should contain 6 monitors at a height of about 6 feet above ground level (the breathing zone for a worker), arranged at approximately equal distances.
2. The second ring should be at the outer margin (perimeter) of the property. This ring should contain 6 monitors at a height of about 6 feet above ground level, plus six additional monitors at a height of about 12-15 feet above the ground. The purpose of the monitors at 12-15 feet is to provide preliminary information on the vertical gradient of dust concentrations values. As above, these monitors should be arranged at approximately equal distances.
3. The third ring should be located another 50-75 feet beyond the second ring. This ring should contain at least 6 monitors at a height of about 6 feet above ground level, arranged at approximately equal distances.

This array of monitors (a minimum of 24 total) is expected to provide a reasonable characterization of the spatial pattern and extent of asbestos release. If initial studies determine that substantial releases occur as far out as the third ring, additional rings and additional monitors may be used in subsequent projects.

In addition, two monitors should be placed at a height of about 6 feet above the ground at locations that are at least 1/4 to 1/2 mile away from the site in an area where no cleanup activities are taking place, preferably in an upwind direction. The purpose of these monitors is to serve as a reference for the three rings of monitors around the demolition site.

Placement of all monitors should be carefully recorded using GPS and photo-documentation.

All stationary air monitors will be turned on shortly before demolition activities begin, and will continue until demolition activities cease for the day. If demolition activities span more than one day, independent samples will be collected on each day.

All stationary air samples will be analyzed using both PCM and TEM, and will be analyzed with an analytical sensitivity of 0.0001 s/cc. This analytical sensitivity is more than sufficient to detect with high confidence any airborne concentration that would be of potential inhalation concern for short-term exposure of an off-site resident to airborne releases (see Attachment 1).

The strategy for evaluating the results will depend on the wind conditions on the day of collection. If the average wind speed is between 3-10 miles per hour and is approximately constant in direction, then the basic approach will be to compare upwind with downwind samples. If the wind is calm (less than 3 mph), or if the wind direction shifts direction during the day, then the basic approach will be to compare stations as a function of distance from the site Differences between samples will be analyzed using the basic methods recommended by Nelson (1982) for comparing two Poisson rates.

3.3.3 Impacts to On-Site Soils

Once building demolition is complete and debris is removed, it will be necessary to sample the soil below and adjacent to the demolition site in order to determine if the soil has become contaminated with asbestos and, if so, whether the level is acceptable to leave in place or whether soil removal is needed. In order to achieve this objective, soil samples will be collected and analyzed by PLM-VE in accord with SOP SRC-LIBBY-03, and/or by TEM in accord with SOP EPA-LIBBY-03.

Exact on-site soil sampling locations will be specified in the project-specific plan. In general, approximately one 5-point composite samples should be collected per 1,000 square feet of area within the footprint of the former building. In addition, composite samples should be collected from 2-4 locations (depending on the size of the project) that are outside the building footprint but inside the bermed area, focusing on locations where water tended to collect. The soil samples will be analyzed by PLM-VE and evaluated in accord with the current procedure for assessing surface soil (USEPA 2003).

3.3.4 Impacts to Off-Site Soils

Even if demolition activities do not cause airborne levels of asbestos to reach a level of health concern to workers or nearby residents, asbestos released in demolition dust could settle on outdoor soils at nearby properties, potentially resulting in long-term exposures of residents. The potential for concern due to this exposure scenario might be evaluated by measuring the concentration of asbestos in soil before and after demolition, but available methods for the analysis of soil have only marginal sensitivity and relatively low precision, and this would likely prevent the detection of any but the largest impacts to soil. Because of these limitations, impacts to soil will be evaluated by collecting and analyzing dust that falls out to soil during building demolition. This approach has the advantage that analysis of settled dust has much better sensitivity and better precision that the analysis of soil, and the impact of the dust fallout to soil can be easily calculated.

Settled dust collectors will be set up at multiple locations around the site and used to measure the asbestos content of dust that falls out from air to soil during demolition activities. SOP SRC-LIBBY-06 describes the method for collecting and analyzing settled dust samples. The exact location of outdoor settled dust collectors may vary, but in general they should be placed in three concentric rings around the site at approximately the same locations as the stationary air monitors. Care should be taken to place the collectors in locations where they are not likely to be knocked over by workers or residents. Attachment 2 (Section 3) presents a screening level derivation of the level of concern in outdoor settled dust that would be of potential concern as an incremental impact on soil. In order to detect an increase of at least 0.001% by mass in soil, and assuming an average asbestos particle in soil weighs about 4E-12 grams, the required sensitivity would be about 6E+06 s/cm^2. Actual sensitivities will be on the order of 1E+03 s/cm^2 or better, ensuring that if significant contamination of soil occurred, it would be readily observed and reliably quantified via analysis of samples of settled outdoor dust.

3.3.5 Impacts to Indoor Dust at Nearby Buildings

As discussed above, asbestos released into airborne dust during demolition activities could settle on interior surfaces in nearby buildings, potentially resulting in long-term exposures of residents or workers. The potential for concern due to this exposure scenario could be evaluated by collecting and comparing samples of dust before and after demolition, but collection of dust that settles out onto surfaces during and after demolition activities is likely to provide a much more sensitive method for quantifying the impact of dust fallout on indoor dust levels.

Settled dust will be collected in accord with SOP SRC-LIBBY-06 at indoor locations in residences and businesses located near building demolition activities. Samples will be collected both before demolition occurs (to provide a “baseline” measurement of asbestos deposition rates) and during the demolition period. The difference between these two samples will be used as the means for estimating the magnitude of any increase in indoor dust contamination caused by demolition. The exact location of indoor settled dust collectors may vary, but in general, collectors should be placed in buildings closest to the demolition site, with an emphasis on buildings in the downwind direction. The number of indoor dust samples to be placed in each building may vary, but in general at least two should be placed. The precise location within each building may vary, but in general the locations should be on a level surface (floor, table, etc.) located near any doors or windows that might serve as an entry point for airborne dusts.

3.3.6 Runoff Water

As noted above, berms will be used to trap any water runoff from the demolition site, so migration of asbestos to off-site locations in water is not a source of concern. At demolition sites where runoff water from spraying is collected, it is expected that the water will be transported to the project landfill for disposal. In this case, there is no need to measure or analyze asbestos levels in the water. At sites where water infiltrates into soil, any impacts on the soil that remains after removal of debris and contaminated surficial soil will be evaluated as described above.

4.0 REFERENCES

Nelson W. 1982. Applied Life Data Analysis. John Wiley and Sons, New York.

USEPA. 1991. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. Memo from Don R. Clay, Assistant Administrator, dated April 22, 1991. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. OSWER Directive 9355.0-30.

USEPA 2003. Libby Asbestos Site, Residential/Commercial Cleanup Action Level And Clearance Criteria Technical Memorandum. Draft Final. U.S. Environmental Protection Agency Region 8. December 15, 2003.

ATTACHMENT 1

DERIVATION OF THE LEVEL OF CONCERN FOR SHORT-TERM EXPOSURE TO ASBESTOS IN AIR DURING DEMOLITION ACTIVITIES AT LIBBY, MONTANA

1.0 INTRODUCTION

Inhalation of asbestos is associated with increased risk of lung cancer and mesothelioma. The USEPA has developed quantitative mathematical models that predict the magnitude of the increase in cancer risk associated with any particular asbestos exposure scenario of concern. The magnitude of the risk depends on the concentration of asbestos in the air, the duration of the exposure, and the age at exposure. Two alternative mathematical models are available for use: 1) the model currently approved for use by the Agency (USEPA 1996, IRIS 2004), referred to as the IRIS model in this report, and 2) a proposed new approach developed by EPA (Berman and Crump 2003) but not yet endorsed for use by the Agency, referred to in this Attachment as the Berman-Crump model. This Attachment applies these two alternative models to calculate the level of asbestos in air that may pose an unacceptable level of health risk to workers and residents who may be exposed to asbestos released to air during demolition activities in Libby, Montana. At present, EPA has not established a method for quantifying or evaluating non-cancer risks from inhalation exposure to asbestos. It is considered likely that if risks of cancer effects are within acceptable limits that risks of non-caner effects will also be below a level of concern, but this is a source of substantial uncertainty.

2.0 EXPOSURE PARAMETERS

The exposure parameters used to calculate the short-term level of concern for workers and nearby residents are summarized below:

Age at Exposure

Risk from asbestos exposure is higher for exposures that occur early in life than for those that occur later in life. Therefore, in order to be maximally conservative, it is assumed that the maximally at-risk resident is a child aged 1 year during exposure. For a demolition worker, it is assumed that the youngest worker is age 18.

Exposure Duration

The duration of building demolition is likely to vary from structure to structure. A value of 5 days has been selected for use in these calculations. It is suspected that most demolition projects will be completed in less than 5 days.

Breathing Rate

In accord with standard EPA guidelines, workers are assumed to inhale 10 m^3 of air per 8-hour work day (USEPA 1993). USEPA has not identified a national default breathing rate for residential children, but USEPA Region 3 uses a value of 12 m^3 per 24-hour day for the calculation of risk-based concentrations of chemical in water and air, and that value is selected for use in this Attachment.

Maximum Allowable Lifetime Excess Cancer Risk

The maximum allowable excess lifetime cancer risk associated with the demolition of a building is a matter of risk management judgment. For the purposes of these calculations, a value of 1E-04 was used for residents, which is the upper end of EPA's usual acceptable risk range. This is based on the expectation that any individual resident will not be impacted by more than one demolition project. For workers, a value of 1E-05 was used to account for the possibility that the same workers might be involved in the demolition of multiple buildings in Libby.

3.0 RESULTS

Based on these exposure assumptions, the short-term concentration levels of asbestos in air that are of potential human health concern were calculated using the life-table method described in USEPA (1986) and in Berman and Crump (2003), defining the level of concern as a total lifetime excess cancer risk (lung cancer plus mesothelioma) of 1E-04. Results based on the IRIS model are expressed in units of PCME s/cc, and the results from the Berman-Crump (2003) model are expressed in units of Berman-Crump (BC) s/cc. A PCME structures is ≥ 5 um in length, ≥ 0.25 um in thickness, and has an aspect ratio ≥ 3:1. Berman Crump structures are ≥ 10 um in length and ≤ 0.4 um in thickness. The resulting risk-based values for short-term exposure to air are presented below:

Short-Term (5-Day) Level of Concern (s/cc) Using Risk-Based Particles Sizes

Population	IRIS (PCME s/cc)	Berman-Crump 2003 (BC s/cc)	
		LA	Chrysotile
Workers	1.09 [1.0][a]	0.36	1.82
Residents	27.2 [1.0][a]	9.08	45.4

(a) As seen, the levels of concern for PCM particles calculated in this way exceed occupational standards for short-term exposure to asbestos (STEL = 1.0 PCM s/cc). Therefore, the STEL is adopted as the short-term level of concern for the IRIS method. There is no analogous occupational guideline for exposures expressed in units of Berman-Crump s/cc.

Particle size distribution data for air samples collected at Libby indicate that about 43% of all ISO 10312 TEM structures in air are PCME structures, and that about 4.1% of all ISO 10312 TEM structures in air are Berman-Crump protocol structures (USEPA 2003). Based on these ratios, it is possible to convert the PCM-based STEL of 1.0 s/cc into units of total ISO s/cc, as follows:

Short-Term Level of Concern (s/cc) Using Total ISO Structures

Population	IRIS (ISO s/cc)	Berman-Crump 2003 (ISO s/cc)	
		LA	Chrysotile
Workers	2.3	8.9	44
Residents	2.3	220	1100

In order to be assured that concentration levels of potential health concern would be detected and quantified with good reliability, the target sensitivity is set at a level below the level of concern. In this case, the level of concern is 2.3 s/cc, so the target sensitivity is set to a maximum of 0.2 s/cc. In practice, a sensitivity of 0.001 s/cc will be sought in most analyses.

REFERENCES

Berman and Crump 2003. Technical Support Document for a Protocol to Assess Asbestos-Related Risk. Final Draft. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 9345.4-06. October 2003.

USEPA 1986. Airborne Asbestos Health Assessment Update. U.S. Environmental Protection Agency, Office of Health and Environmental Assessment. EPA/600/8-84/003F. June 1986.

USEPA. 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. Draft, dated 11/04/93. U.S. Environmental Protection Agency.

USEPA 2005. Supplemental Quality Assurance Project Plan for the Superfund Remedial Investigation at Libby, Montana. Draft Final. U.S. Environmental Protection Agency, Region 8. March 15, 2005.

ATTACHMENT 2

DERIVATION OF THE LEVEL OF CONCERN FOR ASBESTOS IN SETTLED DUST

1.0 INTRODUCTION

If asbestos is released to air during demolition activities in Libby, the asbestos particles will eventually fall to earth and be deposited either on the ground or on indoor surfaces at nearby properties. This Attachment summarizes a screening-level approach for estimating whether the level that is deposited from fallout of demolition-related dust is of health concern or not.

2.0 LEVEL OF CONCERN FOR SETTLED INDOOR DUST

The level of risk associated with asbestos fibers in indoor dust depends on the extent to which indoor dust is suspended in indoor air. The relation between asbestos in dust and in air may be described by Kda, which is the ratio of concentrations in air and dust, as follows:

$$Kda = C(air) / C(dust)$$

Data are limited on the Kda factor for indoor dust in homes and businesses, but an average value of about 4E-06 s/cc per s/cm^2 is likely to be conservative (USEPA 2003).

To find the acceptable level in dust, it is first necessary to find the acceptable level in air. As noted above (see Attachment 1), the risk from asbestos in air depends on the concentration of asbestos fibers in air, the duration of the exposure, and the age at exposure. For this calculation, it is assumed that the duration of exposure is 5 years, since it is suspected that most asbestos that is deposited in indoor dust as a consequence of releases from a demolition activity will be largely removed by routine cleaning (dusting, vacuuming) within that time span. As above, the age at start of exposure is assumed to be one year, since exposures early in life result in higher risks than exposures later in life. Based on these assumptions, and setting the maximum acceptable lifetime excess cancer risk (lung cancer plus mesothelioma) to be 1E-04, the levels of concern in air were calculated using the life-table method described in USEPA (1986) and in Berman and Crump (2003), with the following results:

Levels of Concern in Air for 5-Year Exposures of Residents

Risk Model	Asbestos Type	Asbestos Level of Concern	
IRIS (2004)	All types	0.0037 PCME s/cc	0.0086 ISO s/cc
Berman-Crump (2003)	Amphibole	0.00014 BC s/cc	0.0034 ISO s/cc
	Chrysotile	0.030 BC s/cc	0.73 ISO s/cc

Using a Kda factor of 4E-06 s/cc per s/cm^2, the level of concern in dust may be calculated as follows:

Level of Concern in Dust

Risk Model	Asbestos Type	Asbestos Level of Concern	
IRIS (2004)	All types	925 PCME s/cm^2	4,900 ISO s/cm^2
Berman-Crump (2003)	Amphibole	35 BC s/cm^2	1,900 ISO s/cm^2
	Chrysotile	7,500 BC s/cm^2	420,000 ISO s/cm^2

In order to assure that these levels would be readily detected and quantified if present, the target sensitivity for dust analysis is set to a value about 1/10 the minimum level of concern. This results in a target sensitivity of 190 ISO s/cm^2 (rounded to 200 s/cm^2).

3.0 LEVEL OF CONCERN FOR OUTDOOR SOIL

Asbestos released into air during demolition may also be deposited on outdoor surfaces such as yards and play areas. The increase in soil concentration caused by a dust release depends on the dust loading to soil, the assumed mixing depth in soil, and on the average mass of an asbestos particle:

$$C(soil) = L / (M \cdot D) \cdot m \cdot 100$$

where:

C(soil) = concentration of asbestos in soil (grams per 100 grams)
L = loading of asbestos from demolition (s/cm^2)
M = mixing depth (cm)
D = density of soil (g/cm^3)
m = average mass of an asbestos particle (grams asbestos per particle)

Assuming a mixing depth of 1 cm, a soil density of 2.5 g/cm^3, and an average asbestos particle mass of about 4E-12 g/particle (USEPA 2005), the increment in soil concentration (mass %) due to a dust loading of L s/cm^2 is approximately:

$$C(\text{mass } \%) = (1.6E\text{-}10) \cdot L$$

At present, the relationship between asbestos concentration in soil and the risk to humans is not well characterized. Based on screening level assumptions about the extent of soil transfer into outdoor air and indoor dust, it seems likely that an increment in asbestos concentration of 0.001% or less in soil would not be of significant health concern (USEPA 2005). Based on this, the minimum asbestos loading that would be of concern as a significant source to outdoor soil is calculated as:

$$L = 0.001 / 2E\text{-}09 = 6{,}250{,}000 \text{ s/cm}^2$$

REFERENCES

USEPA 2003. Libby Asbestos Site Residential/Commercial Cleanup Action Level And Clearance Criteria. Technical Memorandum. Draft Final. U.S. Environmental Protection Agency, Region 8. December 15, 2003

USEPA 2005. Supplemental Quality Assurance Project Plan for the Superfund Remedial Investigation at Libby, Montana. Draft Final. U.S. Environmental Protection Agency, Region 8. March 15, 2005.